

Name of student _____

Time: 36 minutes

Year 10

Algebra 4

ATLs Focus

Self-Management, Thinking

Key Concept

Form

Related Concepts

Equivalence, Representation

Statement of Inquiry:

Real life problems can be solved using technically innovative methods by representing the information in equivalent, algebraic, numerical, and graphical forms.

Task Specific Guidance:

- The total mark for this paper is 30.
- Try and answer all questions
- Calculators **cannot** be used.
- Without enough working, correct answers may be awarded no marks.
- Answer the questions in the spaces provided-there may be more space than you need.
- The marks for each question are shown in brackets - use this as a guide as to how much time to spend on each question.
- Read each question carefully before you start to answer it.
- Check your answers if you have time at the end.

Assessment criteria: Assessment criteria Each Maths objective correspond to one of four equally weighted assessment criteria. Each criterion has eight possible achievement levels (1–8), divided into four bands with unique descriptors that teachers use to make judgments about students' work.

Criterion Shade in appropriate one(s)	Criterion A: Knowing and understanding	Criterion B: Investigating patterns	Criterion C: Communicating	Criterion D: Applying mathematics in real- life contexts
Level				

Global context: Students explore key and related concepts through MYP

Identities and relationships	Orientation in space and time	Personal and cultural expression	Scientific and technical innovation	Globalization and sustainability	Fairness and development
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Teacher comments/ feedback:

Student comments / reflections

Criterion A: Knowing and understanding

Maximum: 8

At the end of year 4, students should be able to:

- select appropriate mathematics when solving problems in both familiar and unfamiliar situations
- apply the selected mathematics successfully when solving problems
- solve problems correctly in a variety of contexts.

Criterion B: Investigating patterns

Maximum: 8

At the end of year 4, students should be able to:

- select and apply mathematical problem-solving techniques to discover complex patterns
- describe patterns as relationships and/or general rules consistent with findings
- verify and justify relationships and/or general rules.

Criterion C: Communicating

Maximum: 8

At the end of year 4, students should be able to:

- use appropriate mathematical language (notation, symbols and terminology) in both oral and written statements
- use appropriate forms of mathematical representation to present information
- move between different forms of mathematical representation
- communicate complete and coherent mathematical lines of reasoning
- organize information using a logical structure.

Criterion D: Applying mathematics in real-life contexts

Maximum: 8

At the end of year 4, students should be able to:

- identify relevant elements of authentic real-life situations
- select appropriate mathematical strategies when solving authentic real-life situations
- apply the selected mathematical strategies successfully to reach a solution
- explain the degree of accuracy of a solution
- explain whether a solution makes sense in the context of the authentic real-life situation

Answer **all** questions in the spaces provided.

Level 1 & 2

Q1

Work out $2000 \times 70\,000$

Give your answer in standard form.

[2 marks]

$$14\,000\,000 = 1.4 \times 10^8$$

Answer _____

Q2

Solve $8x + 7 = 2x + 10$

$$6x + 7 = 10$$

[3 marks]

$$6x = 3$$

$$x = \frac{3}{6}$$

$$x = \frac{1}{2}$$

$$x = \underline{\hspace{2cm}} \frac{1}{2}$$

Level 3 & 4**Substitution & elimination****Q3**

Solve the simultaneous equations

$$2x + 4y = -9 \quad (1)$$
$$2y = 4x - 7 \quad \rightarrow \quad 4y = 8x - 14 \quad (2)$$

[4 marks]Sub equation (2) into (1)

$$2x + 8x - 14 = -9 \quad \rightarrow \quad 2y = 4\left(\frac{1}{2}\right) - 7$$

$$10x - 14 = -9 \quad 2y = 2 - 7$$

$$10x = 5$$

$$2y = -5$$

$$x = \frac{5}{10}$$

$$y = -\frac{5}{2}$$

$$x = \frac{1}{2}$$

$$x = \frac{1}{2} \quad y = \frac{-5}{2}$$

on

$$x = 0.5 \quad y = -2.5$$

Q4

$$(x+a)(x+3a) \equiv x^2 + bx + 75$$

Work out the **two** possible values of b .

[3 marks]

$$x^2 + 3ax + ax + 3a^2 \equiv x^2 + bx + 75$$

$$x^2 + 4ax + 3a^2 \equiv x^2 + bx + 75$$

$$3a^2 = 75$$

$$a^2 = 25$$

$$a = \pm 5$$

Answer $+5$ and -5

Q5

Rearrange $y = \frac{1}{\sqrt{x+1}}$ to make x the subject.

[3 marks]

$$y \sqrt{x+1} = 1$$

$$\sqrt{x+1} = \frac{1}{y}$$

$$x+1 = \frac{1}{y^2}$$

$$x = \frac{1}{y^2} - 1$$

Answer

Level 5 & 6

Q6

Here is an identity.

$$x^2 - y^2 = (x + y)(x - y)$$

Use the identity to work out the value of $193^2 - 7^2$

You must show your working.

[2 marks]

Let $x = 193$ & $y = 7$

$$\begin{aligned} 193^2 - 7^2 &= (193 + 7)(193 - 7) \\ &= 200 \times 186 = 37200 \end{aligned}$$

Answer 37200

Q7

s and t are positive integers.

$(x + s)(x - t)$ is expanded and simplified.

The answer is $x^2 + kx - 40$ where k is a positive integer.

Work out the smallest possible value of k .

[2 marks]

$$\begin{aligned} &x^2 + sx - tx - st \\ &= x^2 + (s-t)x - st \end{aligned}$$

$$\therefore -st = -40 \quad s-t = k$$

$$st = 40$$

If $s = 8$ and $t = 5$

$$k = 8 - 5$$

$$k = 3$$

s	t
1	40
40	1
2	20
20	2
5	8

Answer 3

Q8

Factorise

$$5x^2 + 6x - 8$$

$$\frac{-40}{-4 + 10}$$

[2 marks]

$$5x^2 - 4x + 10x - 8$$

$$= x(5x - 4) + 2(5x - 4)$$

$$= (x+2)(5x-4)$$

Answer $(x+2)(5x-4)$

Q9

Rearrange $y = \frac{5x+9}{x}$ to make x the subject.

[4 marks]

$$xy = 5x + 9$$

$$xy - 5x = 9$$

$$x(y-5) = 9$$

$$x = \frac{9}{y-5}$$

Answer $x = \frac{9}{y-5}$

Level 7 & 8**Q10**

Simplify fully $(y^2 - 3y) \times \frac{y^2 + 10y + 21}{y^2 - 9}$

[4 marks]

$$\cancel{y(y-3)} \times \frac{(y+7)(y+3)}{\cancel{(y+3)(y-3)}}$$

$$= y(y+7)$$

Answer _____

Q11

Factorise $100a^2 - 81b^2$

[1 mark]

Answer _____ $(10a - 9b)(10a + 9b)$

END OF QUESTIONS

	Criterion A: Knowing and understanding	Criterion B: Investigating patterns	Criterion C: Communicating	Criterion D: Applying mathematics in real-life contexts
Level	The student is able to:	The student is able to:	The student is able to:	The student is able to:
1-2	i. select appropriate mathematics when solving simple problems in familiar situations	i. apply, with teacher support , mathematical problem-solving techniques to recognize simple patterns	i. use limited mathematical language	i. identify some of the elements of the authentic real-life situation
	ii. apply the selected mathematics successfully when solving these problems	ii. state predictions consistent with patterns.	ii. use limited forms of mathematical representation to present information	ii. apply mathematical strategies to find a solution to the authentic real-life situation, with limited success
	iii. generally, solve these problems correctly in a variety of contexts.		iii. communicate through lines of reasoning that are difficult to interpret .	
3-4	i. select appropriate mathematics when solving more complex problems in familiar situations	i. apply mathematical problem-solving techniques to discover simple patterns	i. use some appropriate mathematical language	i. identify the relevant elements of the authentic real-life situation
	ii. apply the selected mathematics successfully when solving these problems	ii. suggest relationships and/or general rules consistent with findings	ii. use appropriate forms of mathematical representation to present information adequately	ii. select, with some success, adequate mathematical strategies to model the authentic real-life situation
	iii. generally, solve these problems correctly in a variety of contexts.		iii. communicate through lines of reasoning that are able to be understood , although these are not always clear	iii. apply mathematical strategies to reach a solution to the authentic real-life situation
			iv. adequately organise information using a logical structure.	iv. describe whether the solution makes sense in the context of the authentic real-life situation.
5-6	i. select appropriate mathematics when solving challenging problems in familiar situations	i. select and apply mathematical problem-solving techniques to discover complex patterns	i. usually use appropriate mathematical language	i. identify the relevant elements of the authentic real-life situation
	ii. apply the selected mathematics successfully when solving these problems	ii. describe patterns as relationships and/or general rules consistent with findings	ii. usually use appropriate forms of mathematical representation to present information correctly	ii. select adequate mathematical strategies to model the authentic real-life situation
	iii. generally, solve these problems correctly in a variety of contexts.	iii. verify these relationships and/or general rules	iii. move between different forms of mathematical representation with some success	iii. apply the selected mathematical strategies to reach a valid solution to the authentic real-life situation
			iv. communicate through lines of reasoning that are usually coherent .	iv. describe the degree of accuracy of the solution
			v. present work that is usually organized using a logical structure	v. discuss whether the solution makes sense in the context of the authentic real-life situation.
7-8	i. select appropriate mathematics when solving challenging problems in both familiar and unfamiliar situations	i. select and apply mathematical problem-solving techniques to discover correct patterns	i. consistently use appropriate mathematical language	i. identify the relevant elements of the authentic real-life situation
	ii. apply the selected mathematics successfully when solving these problems	ii. describe patterns as relationships and/or general rules consistent with correct findings	ii. use appropriate forms of mathematical representation to consistently present information correctly	ii. select appropriate mathematical strategies to model the authentic real-life situation
	iii. generally, solve these problems correctly in a variety of contexts.	iii. verify and justify these relationships and/or general rules.	iii. move effectively between different forms of mathematical representation	iii. apply the selected mathematical strategies to reach a correct solution
			iv. communicate through lines of reasoning that are complete and coherent	iv. explain the degree of accuracy of the solution
			v. present work that is consistently organized using a logical structure.	v. explain whether the solution makes sense in the context of the authentic real-life situation.